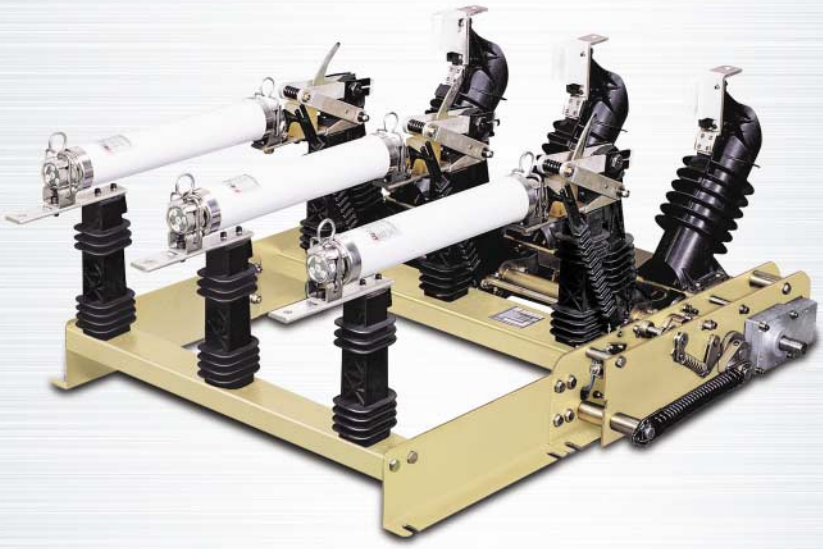
Leader in Electrics & Automation

Tri-MEC

Load Break Switch



Electric Equipment

LS Industrial Systems

www.lsis.biz

Leader in the field of industrial electricity & automation creating the comfortable and productive society through providing Total-Solution.

Enabling you to feel the difference in the performance and technology of improved product of Load Break Switch completed with LS technology and testing equipments.

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Applied by new mechanism

LS Load Break Switch TRI MEC

Being applied by new concept bendable type blade structure
LS Air Insulated Load Break Switch has further been intensified with safety and reliability and upgraded to higher stage with the performance realization through accurate technology interpretation and actual testing.

Incorporation of maximum strength through CAE interpretation

Optimization design of discharge input for stable Arc extinction

Optimization design of 3D for maximization of extinction force

General features

In application of new concept mechanism of bendable type blade structure LS Tri-MEC Air Insulited Load Break Switch (LBS) has been equipped with further advanced technology and in a system switching the circuits when checking, measuring, testing and repairing the instruments. at branch point with 3 phase load break switch designed customer-orientedly and considerably.

In particular, a bendable type blade structure is significantly small in operation radius in contrast with existing direct line one and an arc discharge angle at the time of breaking operation is under 50°, thereby reducing the danger of accident by an arc remarkably.

And it is suitable for a metal Enclosed and Package Substation thanks to higher insulation-resistant power and is equipped with durability, stability and economical efficiency. E2 class mechanical strength based on new standard application.

Operation conditions

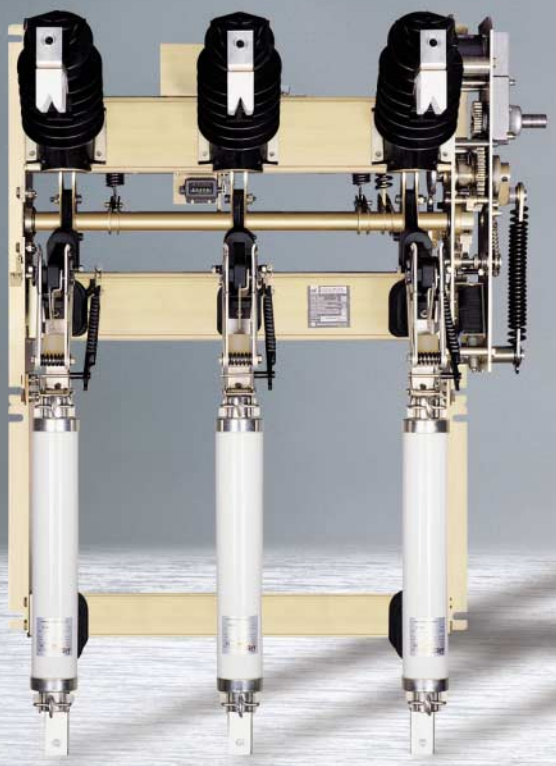
- Standard ambient temperature: under+ 35℃ (24hrs in average)
- Standard temperature: -20℃~+40℃
- Standard storage: -25℃~+60℃
- Humidity: +40℃/85% below
  +20℃/90% below
- Place : Indoor place with clean ambient air not being contaminated with dust, smoke, corrosion substance or combustible substance, salty materials, etc. Never use, store or leave alone this product in the place with sulfuric gas, ammonia gas and corrosive gas. (HS≤0.01ppm, SO2≤0.01ppm, NH3≤a few ppm)
- Altitude: above sea level 1000m below

Applied standards

IEC 62271-105, 60265-1, 60694, 60282-1

Reliable Technology

This product has been verified for its excellency in quality through passing the development test strictly in accordance with New Standard IEC 62271-105 (Switch Fuse) and 60265-1 (Load Break Switch)



TYPE TEST REPORT

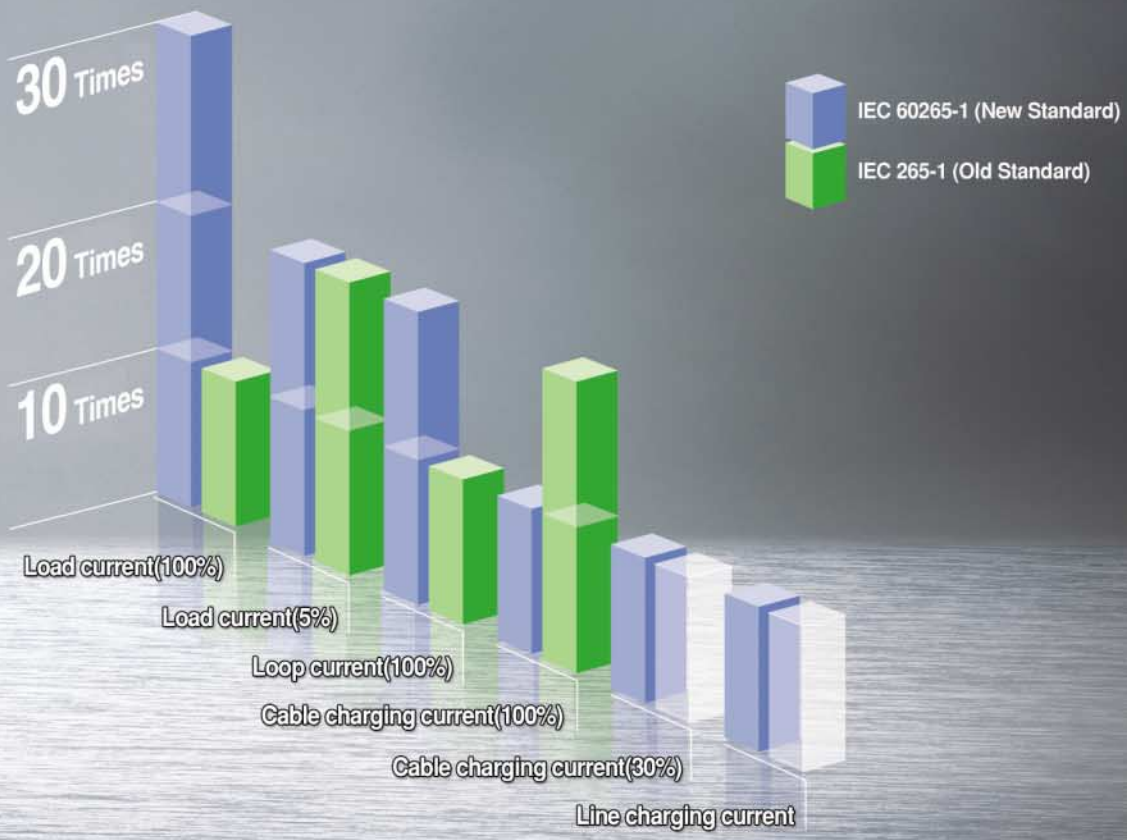
KERI

Design Characteristics

- KERI type test in application of IEC New Standard
  - Approved by KOLAS
    Global key technology accumulation through self development test and analysis by PT & T of public test institute.
- Compact & space saving design
- 3 phase collective operation
- Application with combustion-resistant and high strength engineering
- Compressed air mode arch extinction
- Break switch-fuse combination (24kV 25kA switching, 40kA max)
- Fuse striker automatic trip (DIN 43625)

The Highest Performance in Domestic Market

This product has succeeded in passing electrical performance test with New Standard E2 test grade.



Verification of the most duration times of load break in the country

The performance of this new standard product has been improved by 300% in comparison with old standard one through passing the load break test in application of IEC 60265-1, and an excellent performance has been verified successfully by completing the load break test in application of E2 grade intensified further than new standard E1 grade.

- Load break 100 times
- No load break 1000 times

Passed in transfer current test of fuse combination type

Having been passed recently in the transition current test in accordance with modern international standard 62271-105, this product has increased the reliability sufficiently in application of self developed power-fuse.

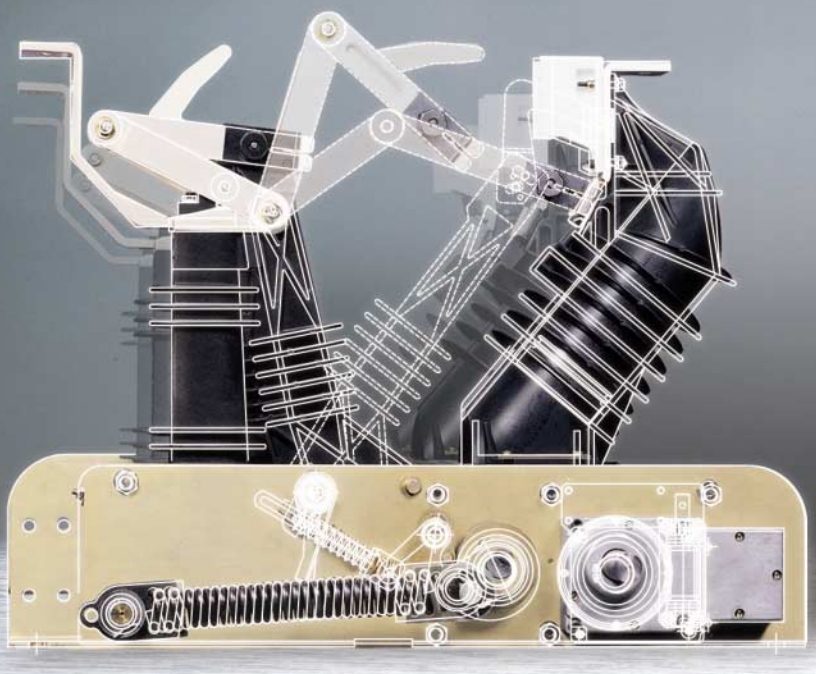
Comparison of development test major items.

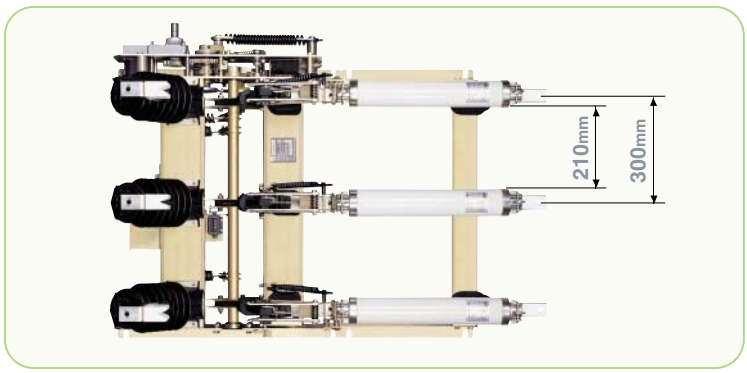
Test item \ Test class	E1 class	E2 class
Rated load current break	10 times	30 times
Short current imput (52kA)	2 times	3 times

Note) E2 grade : test condition requiring the performance higher by maximum 300% than E1 grade in accordance with IEC standard.

Employment of Bendable Type Blade Structure

Through applying a bendable type blade being a double joint type drive structure the stability have been recognized successfully.





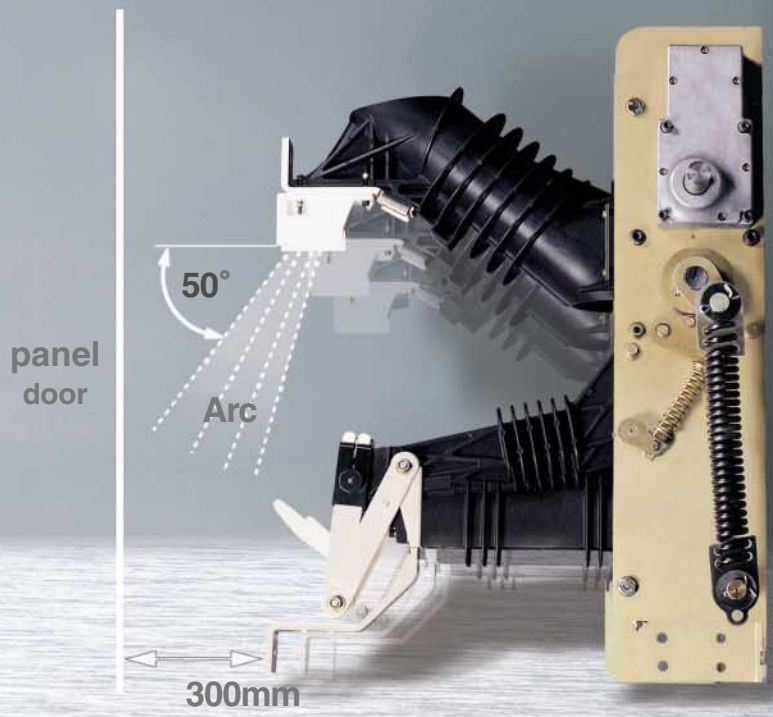
Spacing the maximum inter-phase distance

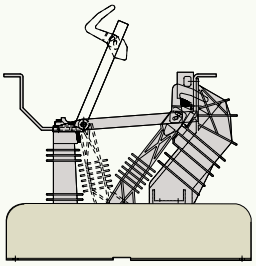
No need to install the separate insulation barrier when assembling Bus-bar at load side equipped with a power fuse.

- Metal to Metal : 210mm
- Center to Center : 300mm

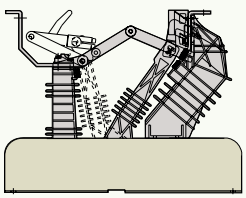
Metal Screen Test

Through passing the Metal Screen Test for the verification of insulation resistance conducted at the distance of 300mm from a panel door, the stability and reliability has been attained to the full satisfaction.





Direct line blade structure



Bendable type blade structure

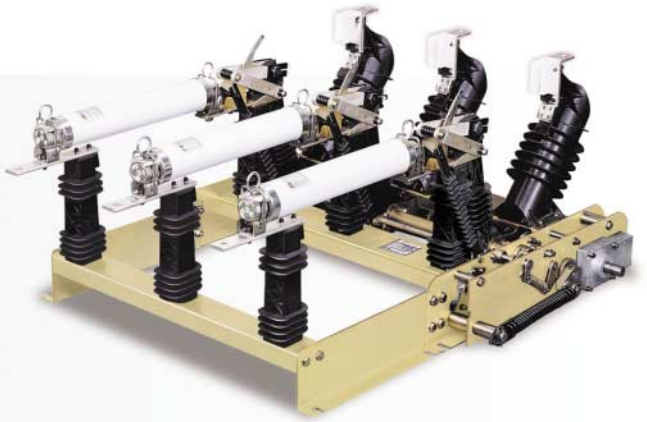
Minimization of break distance

Through employing a direct line flexible type Knife drive structure the break distance and panel depth comparing to an existing direct line type can be reduced remarkably.

And an existing product may require a sufficient insulation distance at 90° against the side of installation in the eruption angle, but for Tri-MEC LBS of a direct line flexible type Knife structure the stability in use has been intensified further since the eruption angle of arc becomes under 50°.

Rating

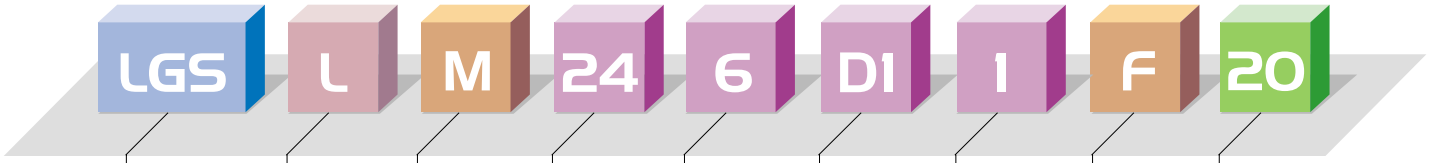
LS Tri-MEC LBS is air insulation type and has a major instrument equipped with the function of a rated load break and a short protection (when a fuse is installed) in nominal voltage 22.9kV distribution system LS and as an indoor installation type it is used in the leading-in instruments and high voltage branch system of user side such as unit type transformer room, general cubicle and panel, protection of transformer and cable in transformer room, condenser bank, motor, etc.



Type				LGS-L-M-24-6	LGS-L-B-24-6
Break switch grade			[IEC]	E2, M1	
Rated voltage			[kV]	24	
Rated current			[A]	630	
Rated frequency			[Hz]	60	
Rated short time current-resistant			[kA]	20	
A short input current			[kAp]	52	
Commercial frequency voltage-resistant	Inter-earth		[kV]	50	
	Inter-polarity		[kV]	60	
Electroencephalo impulse voltage-resistant	Inter-earth		[kV]	125	
	Inter-polarity		[kV]	145	
Current break times	Load current	630A		30	
		31.5A		20	
	Loop current	630A		20	
	Cable charging current	31.5A		10	
		9.45A		10	
	Line charging current	1.5A		10	
Rated transition current			[A]	500	
Rated transition voltage			[Vdc]	110	-
Rated transition current			[A]	5	-
No voltage break times				1000	
Operation				Motor powered	Manual
Weight	Non fuse		[kg]	70	
	Fuse		[kg]	80	

Note) Above weight does not include fuse weight.

Air Insulated Load Break Switch



LS Load break switch

Kind of break switch	
L	Air LBS (Vacuum load type)

Control method	
M	Motor powered
B	Manual

Rated voltage (kA)	
24	24kV

Rated current (A)	
6	630A

Control power	
D1	DC 110V
D2	DC 220V
A1	AC 110V
A2	AC 220V
00	None (manual)

Number of Auxiliary switch	
1	2a2b
2	4a4b

Composition	
S	LBS single type (Right)
F	Fuse interlocked type (Right)
D	LBS single type (Left)
C	Fuse interlocked type (Left)

Manual operation cable	
20	2.0mm
10	1.0mm
15	1.5mm
18	1.8mm
26	2.6mm
35	3.5mm
00	None

Note) 1. Left attaching type of drive mechanism is separate order product (See page 13)
2. A power fuse is only available in DIN product.

Power Fuse

LS power fuse

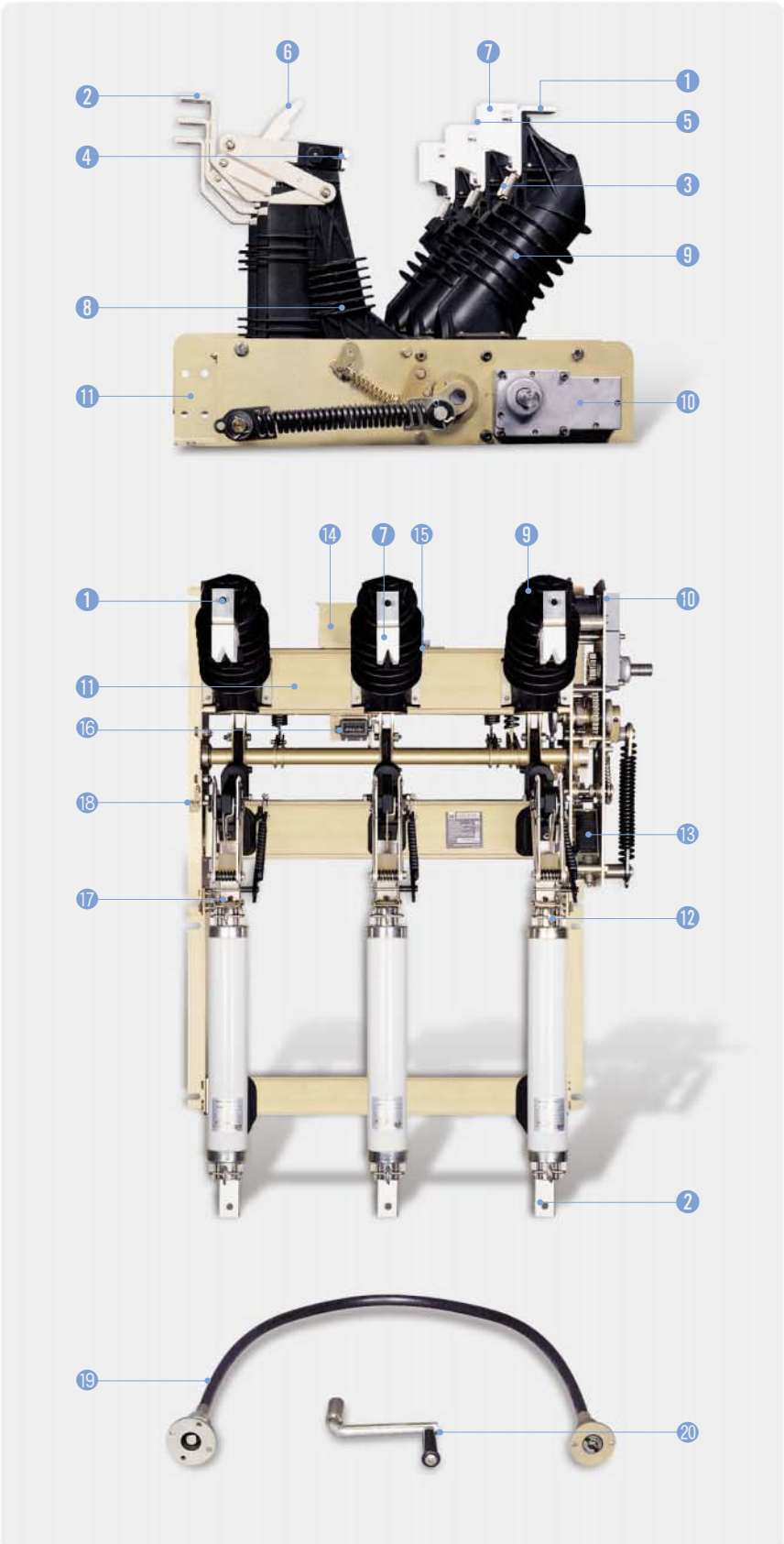
Rated voltage	
20	24kV

General load use

Rated current								
5A	10A	16A	20A	25A	30A	40A	50A	63A

Modification No.

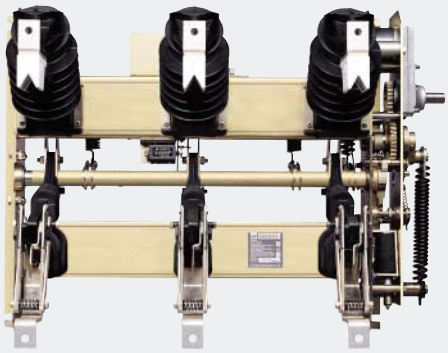
External View



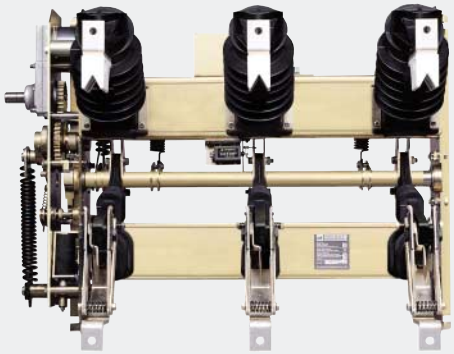
1. Source side terminal
2. Load side terminal
3. Main contact (fixed)
4. Main contact (movable)
5. Arc contact (fixed)
6. Arc contact (movable)
7. Arc extinction nozzle
8. Insulation rod
9. Puffer
10. Motor
11. Base frame
12. Fuse clip
13. Voltage trip device
14. Aux. switch
15. Connector
16. Counter
17. Fuse trip device
18. Fuse check switch
19. Manual operation cable
20. Manual operation handle

Left & right drive mechanism

Easy input operation and trip operation through employing independently developed mechanism and capable of left & right drive mechanism.



Standard type

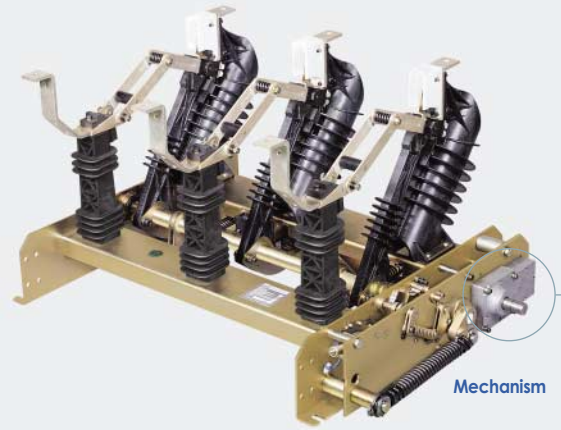


Left side attaching type

Note) Left side attaching type is a separate ordering product.

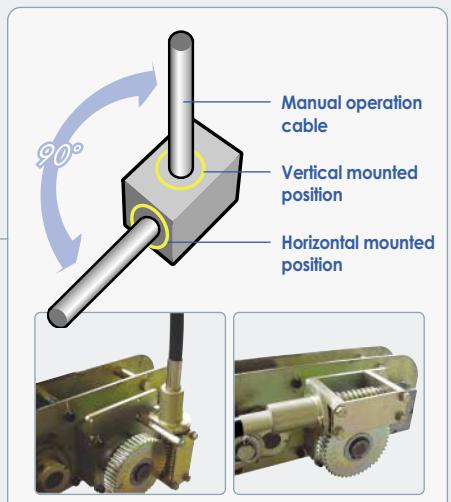
Horizon & vertical installation of manual cable

Capable of attaching 90°Δ turn of manual operation cable in case of manual type, thereby minimizing distorting and twisting of cables by reducing the stress of remote operation flexible joint part depending upon attaching angle of LBS.



Mechanism

Manual operation cable and handle.



Note) Manual operation cable is standard and in case of horizontal installation the use is possible through installation by changing cable kit with simple operation (See manual)

Accessories

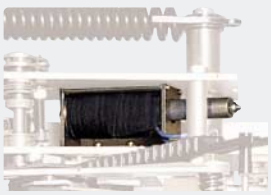
Fuse trip device

A device preventing the defect phase operation by opening a load break switch through interlocking mechanically with a striker at the fusing time.

Voltage trip device

A coil for tripping remotely at the time of system accident or load break

Control circuit rated voltage (V)	Scope of operation voltage (%)	Value of incoming current wave (A)	Normal current (A)	Trip time (ms)
DC 110V	70~110	3	2	75



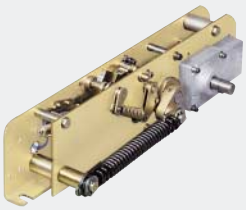
Manual operation device

It is composed of manual operation cable and manual handle as a device used for manual ON/OFF outside a panel and at far distance.
Manual operation cable can be mounted at 90° turn, thus reducing the stress of cable when attaching it vertically or horizontally.

Electric operation device

As advice for ON/OFF of a load break switch at far distance the standard supply voltage is DC 110V.

Rated voltage (V)	Scope of operation voltage (%)	Value of incoming current wave (A)	Normal current (A)	Change time (sec)
DC 110V	85~110	3	2	7.5



Fuse check switch

In case a fuse in fuse interlocked load break switch is melted, as a contact to be operated mechanically through interlocking with a striker it is used in the display of fuse.

Note) The capacity of contact is same as that of Aux. switch.

Counter

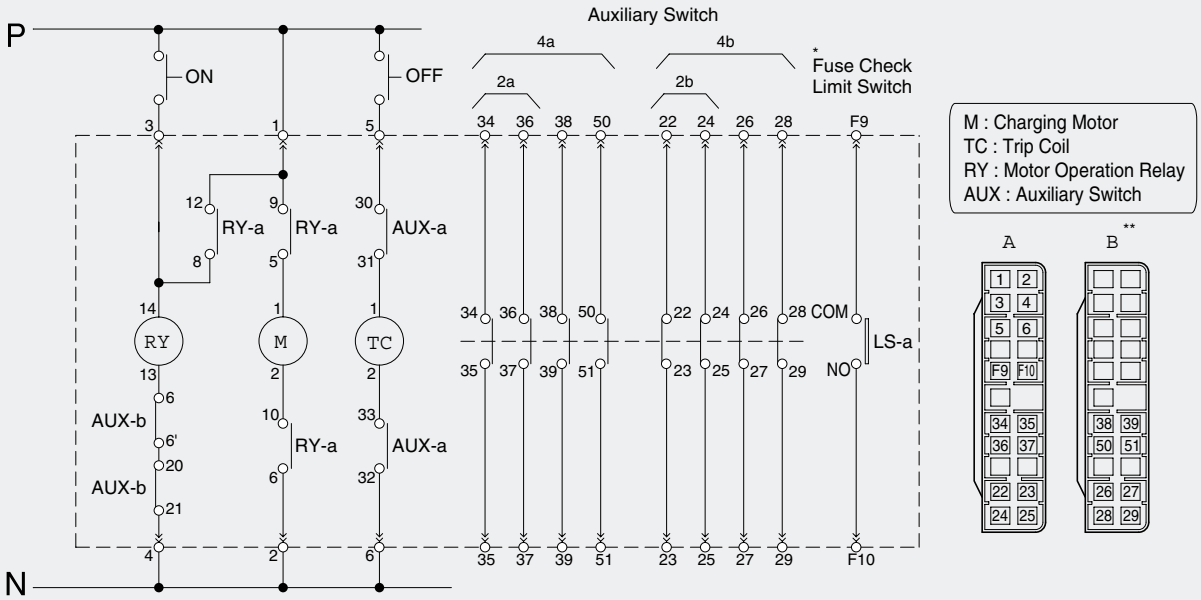
A device displaying the operating times of a break switch in application of 5 Digits

Aux. switch

As a contact to be operated through interlocking mechanically according to ON/OFF condition of main contact of a load break switch it is used in the display or control of condition of a load break switch.

Classification			Resistance load	Inductive load
Contact capacity	AC	440V	3A	1.5A
		220V	5A	2.5A
		110V	10A	5A
	DC	220V	5A	2.5A
		110V	10A	5A
Contact number		AX2/AX4	2a2b/4a4b	

Control circuits



Operation Principle

Motor powered type

A spring for input is enlarged as the turn movement of a drive motor and at this time an accumulated energy to input or open a break switch is conveyed to an axis. As a result, regardless of operator a blade to flow main circuit and to block it is moved at designated speed.

An input instrument part provides a strong force so that a break switch may overcome the explosive force likely to take place in case of inputting under the system accident.

At this time the force is not conveyed to an operation handle and the input can be made even under the rated short accident. A load break switch is composed of a main blade and an arc blade. When a break switch is opened the main blade is opened first and all of currents and extinct through the arc blade. And through dispersing and cooling down the arc with a proper operation of Puffer by Air Piston the damage of an instrument and system can be blocked off early.

Trip Condition

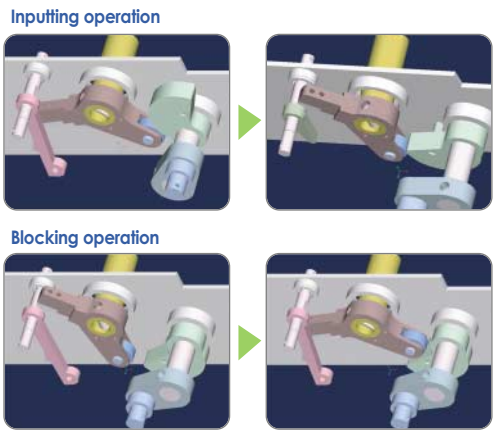
Inputting condition

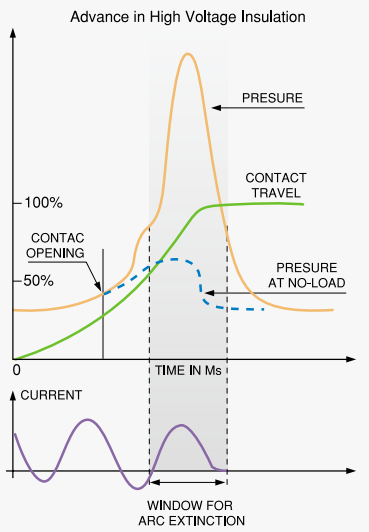
Manual type

Through turning clockwisely and continuously in application of an exclusive handle supplied together with a break switch the input is made, and an opening operation is made by LATCH instrument part through turning the exclusive handle clockwisely and continuously.

Operation of instrument part

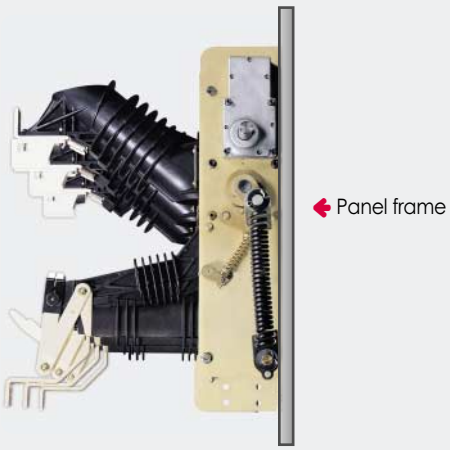
A reduction gear and mechanism axis located at the side of base frame is equipped with a spring cap and lever and it takes a turn exercise of 360° counter-clockwisely. When a hook lever linked to the main axis of a switch takes an up-down turn exercise a moving rod connects a main blade to and an arc blade in conduction part and disconnects them, and opens a load circuit.



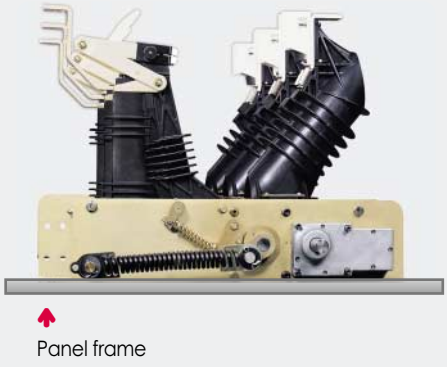


Puffer Type pressure-time characteristics curves

Installation method

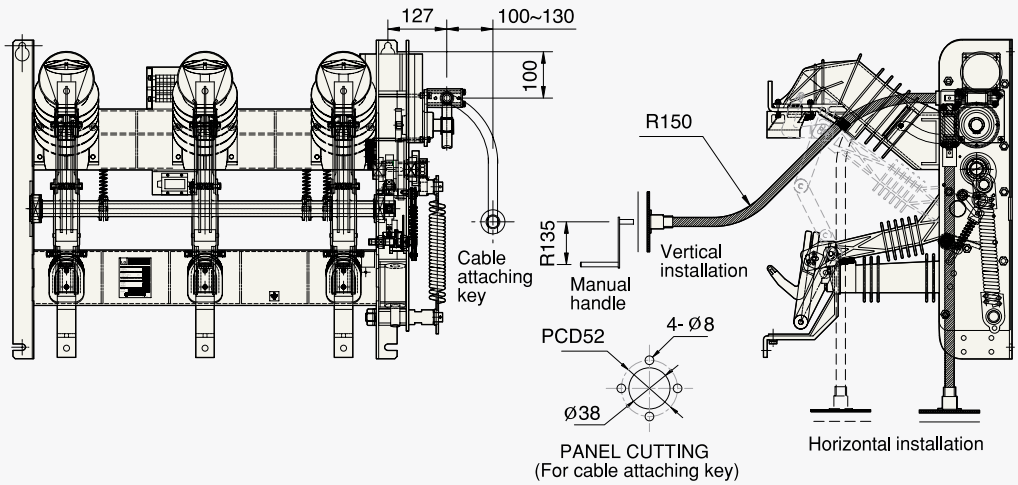


Vertical installation



Horizontal installation

Cable installation by manual operation



Attaching key

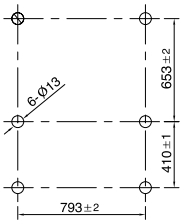
Manual handle

Note) 1. The length of the cable for remote manual operation is mounted on 2.0m basis.
2. Fix the cable attaching key on to the distribution board frame with bolt & nut. Maintain the cable curve radius above R150 and fix it on to the panel pole and etc solidly so that the insulation distance from the earth may be spaced.
3. In case of manual type others than a motor and a trip coil are same as those of electric one.

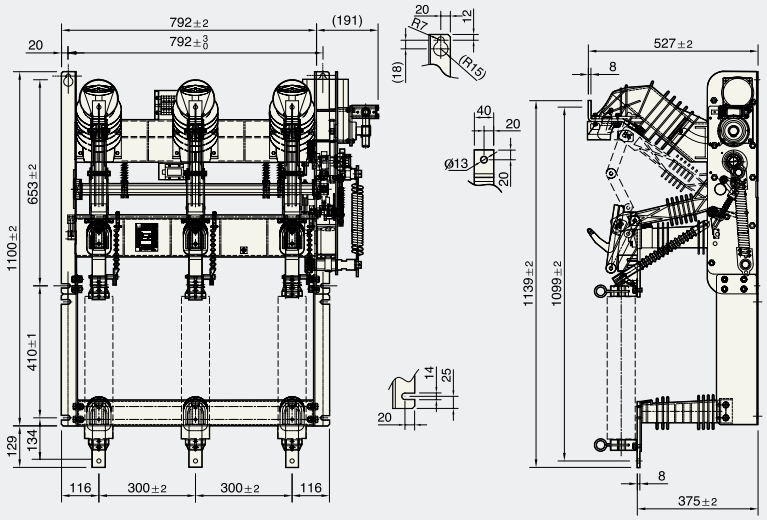
Dimensions

Fuse combination type

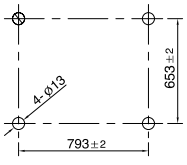
(Unit : mm)



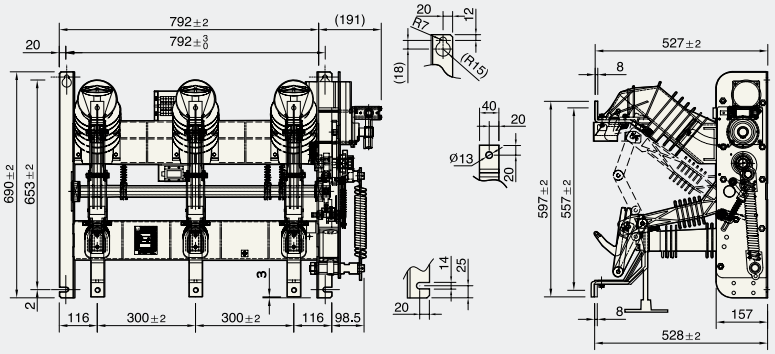
Attaching dimension

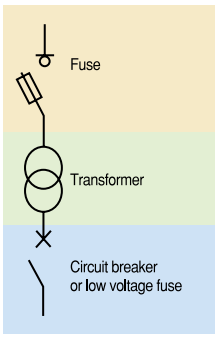


LBS single type



Attaching dimension

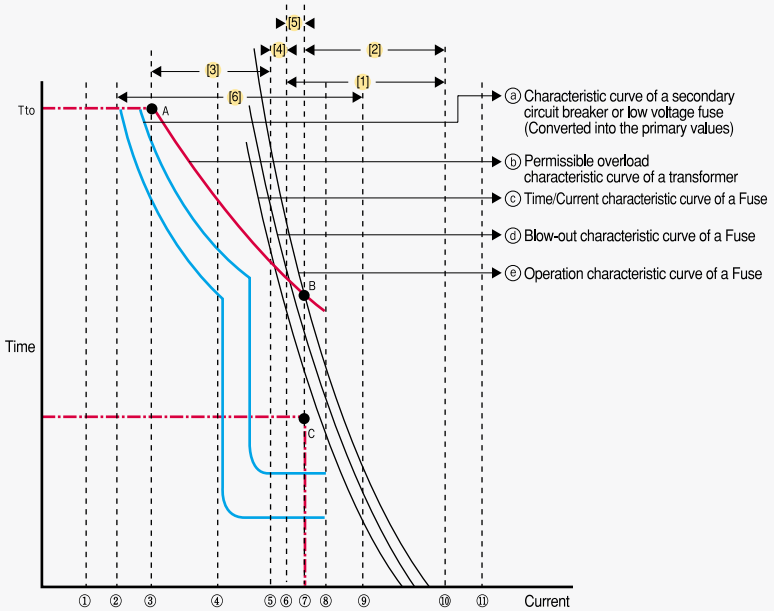




① Full load current of a transformer
② The lowest interrupting current of the secondary circuit breaker
③ Permissible overload current of a transformer
④ Rated current of a fuse
⑤ Lowest blow-out current of a fuse
⑥ Lowest interrupting current of a fuse
⑦ Inrush current at no load of a transformer
⑧ Secondary short-circuit current
⑨ Rated interrupting current of a secondary circuit breaker
⑩ Primary short-circuit current
⑪ Rated interrupting current of a fuse

※ Coordination in the graph

- **Zone of [1]** : Protection of primary side from short-circuit by a fuse
- **Zone of [2]** : Protection of a transformer
- **Zone of [3]** : Out of the scope of fuse operation
- **Zone of [4]** : Interruption is not ensured even though the fuse blows.
- **Zone of [5]** : Protection of a transformer is not ensured even though the fuse interrupts the circuit.
- **Zone of [3]+[4]+[5]** : No protection zone of a transformer Circuit breaker or low voltage fuse required for the transformer protection



A. Permissible overload current/time of a transformer
B. Permissible overload characteristic of a transformer, Operation characteristic curve of a Fuse
C. inrush current and time at no load of a transformer

When any protection device is not installed in the secondary of a transformer

- Permissible overload current of a transformer (point ③)) must lie to the left of the curve ⓒ (time/current characteristic curve of a Fuse)
  Full load current of a transformer ① ≤ Rated current of a fuse ④
- Point C(inrush current and time at no load of a transformer) must lie to the left of the point ⓒ(time/current characteristic curve of a Fuse)
- Secondary short-circuit current⑧ > Lowest interrupting current of a fuse ⑥
  Point B must lie to the left of the secondary short-circuit current⑧.
- Primary short-circuit current⑩ < Rated interrupting current of a fuse⑪

When a circuit breaker or fuse is installed in the secondary of a transformer

- Must meet the requirements above mentioned in ①
- The characteristic curve of a secondary circuit breaker or low voltage fuse ⓐ must lie to the left of permissible overload characteristic curve of a transformer ⓑ and under the point B
- The characteristic curve of a secondary circuit breaker or low voltage fuse ⓐ must lie to the Time/Current characteristic curve of a Fuse and under the Secondary short-circuit current ⑧.
- Secondary short-circuit current ⑧ < Characteristic curve of a secondary circuit breaker or low voltage fuse ⓐ
- The secondary circuit breaker or low voltage fuse should meet the above mentioned requirements to each branch circuit.
- Another medium voltage protection device is required for the ensured protection against the fault happening between the secondary protection devices and the internal short-circuit of a transformer in the zone of [3]+[4]+[5].

Power Fuse

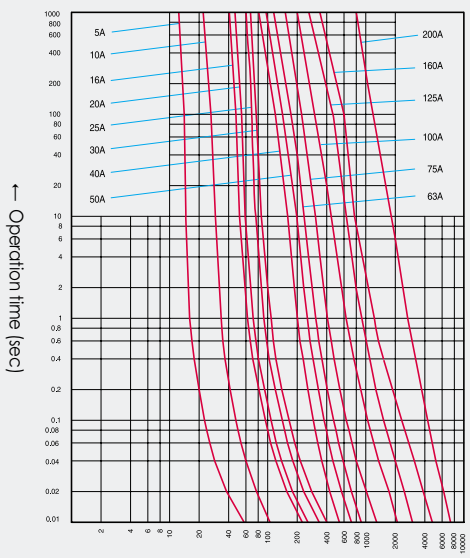
Applied power fuse

LS Prime-MEC Power Fuse is used for protecting circuits and system instruments by severe accident current and in general for protecting transformer circuits, condenser circuits, motor circuits, etc.
The silver is used in elements and through using high quality silica and ceramic magnetic rod and insulating tube the safety and reliability of the product has been improved remarkably.

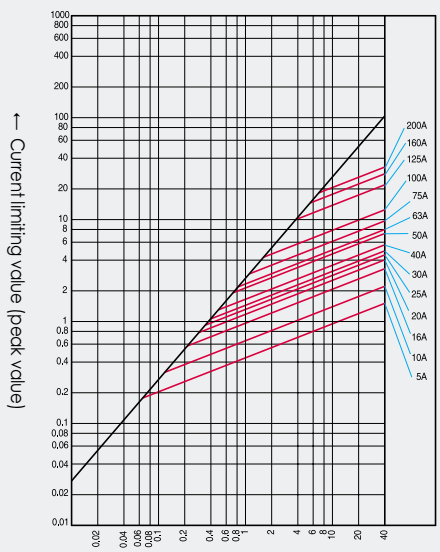
The cautions in applying Fuse

- A fuse has to be selected only for protecting a short circuit accident.
  (Overcurrent can not be protected.)
- A fuse can not use again after operation.
- A proper rated current shall be selected so that a fuse action may not be damaged.
- The most suitable rated current shall be selected in consideration of the fuse use and circuit features since the fuse operation features are fixed according to respective ones.
- It is recommended that the protection be made from other instruments under minimum breaking current, and a proper rated fuse incapable of fuse operating shall be selected.
  - In case of protecting an overload field (under minimum breaking current) a lower fuse in minimum breaking current shall be used or a fuse shall be used through combining the overcurrent breaking devices in series.
- Check if a voltage of circuit is higher than overload voltage of fuse.
- Since a fuse may cause the deterioration even without operation, thereby generating a rated current with a sufficient capacity shall be selected.
- Replace at the time of fuse current.

24kV (fusing-Upholstery) features curve



24kV Current limiting features curve



Seletion conditions

Transformer protection

- A transformer incoming current was selected on the assumption that it is 10 times as full load of transformer for 0.1 sec.
- A fuse rated current was selected so that 1.5 times as a transformer rated current may be flowed continuously.
- A transformer fuse was selected on the assumption that it is broken within 2 secs in 25 times as a transformer rated current when the secondary current is short.

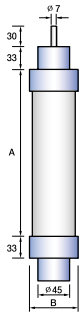
Motor protection

- It is assumed that the inrush current of a motor is 5 times of full load current for 10 seconds.

Condenser protection

- It is assumed that the inrush current of a capacitor is 71 times of its rated current for 0.002 second.
  - The rated current of a fuse is selected to carry continuously the current of 1.43 times of rated current of a capacitor.

- The above mentioned comments are according to KS(Korean Industrial Standard) and subject to the real situation.

G type	Application / Model	Transformer load(kVA)		Comdenser load(kVA)	Dimensions(mm)		Application holder
		Single phase	Three phase	Three phase	A	B	
	LFL - 20G - 5B	20~43	36~75	460이하	442	55	LFH-20G-D2HB
	LFL - 20G - 10B	43~90	75~157	46~83			
	LFL - 20G - 16B	87~180	151~313	64~172			
	LFL - 20G - 20B	99~206	172~358	83~203			
	LFL - 20G - 25B	130~269	224~466	193~272	442	77	
	LFL - 20G - 30B	149~310	258~538	203~317			
	LFL - 20G - 40B	267~557	464~965	317~425			
	LFL - 20G - 50B	345~719	598~1,246	425~564			
	LFL - 20G - 60B	430~897	745~1,554	564~710			
	LFL - 20G - 75C	580~1,145	1,000~1,983	710~1,021	442	87	
	LFL - 20G - 100C	923~1,527	1,600~2,645	1,021~1,655			
	LFL - 20G - 125B	1,364~1,908	2,362~3,304	1,655~2,370			
	LFL - 20G - 160B	2,125~2,443	3,680~4,232	2,370~3,170			
DIN Size	LFL - 20G - 200B	2,650~3,050	4,593~5,287	3,170~4,000	537	87	LFH-20G-D2HC

Memo

Leader in Electrics & Automation

Safety Instructions

- For your safety, please read user's manual thoroughly before operating.
- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

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CHEONG-JU PLANT

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Specifications in this catalog are subject to change without notice due to continuous product development and improvement.

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